Comparative Ethological Study of *Pavocristatus* at Riparian Sites in Agra

SYNOPSIS

Submitted for the registration

Of

The Degree of Doctor of Philosophy

In

ZOOLOGY

Submitted by:

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September-2017

1. Introduction

The national bird of India is theIndian Blue Peafowl that is commonly known as Peacock. This bird is the largest among pheasantsand has been an excellent model of sexual selection studies in classical ethology.

1.1 Systematic position

Kingdom- Animalia

Phylum- Chordata

Class- Aves

Order- Galliformes

Family- Phasianidae

Subfamily- Phasianinae

Genus- *Pavo*

Species- *cristatus*

Plate-1

1.2 Habitat and Distribution

*Pavocristatus*is native to India, Sri Lanka and East Pakistan. According to the report of Bird Life International (2012) it also found in Java, Nepal, Malaysia andMyanmar. The primary habitats of peafowls are as follows according to Loyau*et al*., 2005:-

1. Dry deciduous forests
2. Forest edges
3. Riparian regions
4. Semi-arid regions

1.3 Habit

They are generally ground feeders and seem to be food generalists that are omnivores(Fowler, 2011 and Petrie *et al*., 1999). They have been reported to indulge in dust bath and do not prefer to get wet in the rains as the water makes their coverts too heavy to be able to fly(Fowler, 2011).They are bipedal birds that go into flight mode only to cover short distances. Their limited flight mode is due to the heavy bodies and coverts (Fowler, 2011).

1.4 Conservation status

Its conservation status is LC i.e. Least Concern category according to the IUCN Red Data Book, 2012. It is listed under Schedule I of Wildlife Protection Act, 1972 (Dakin and Montgomerie, 2014).

1.5 Mythological status

It is depicted as Lord Kartikeya's vehicle in Hindu mythology.

1.6 Sexual dimorphism

Males have blue neck, blue crested crown, feathers on tails are long and have spots known as ocelli and males are more colorful and large. Females have grey neck with a green-blue patch on the upper neck region, brownish crest shaped crown and smaller than male (Hillgarth, 1984 and Rands*et al*., 1984).

This species is territorial during breeding season. The males maintain small, courtship display territories. (Bird Life International, 2012; Fowler, 2011 and Harikrishnan et al., 2010). They continuously emit vocalizations during the breeding season to attract females. They can also emit calls that are specifically associated with copulation but the function of these copulation calls is often unknown(Yorzinski and Anoop, 2013).

Recently, in 2016*Pavocristatus* has been a subject of debate to declare it as vermin species in Goa as per a court case reported in The Telegraph and The Guardian newspapers in 2016. This implies

that culling of this species could become legal if it is declared vermin in near future (Anand and Radhakrishna, 2017). Indian Peafowls are under threat due to various reasons like the demand for feathers, flesh, conflict with agricultural practitioners, habitat degradation and recommendationsin traditional medicine(Ramesh and McGowan, 2009).

According to the categorization of ecosystems by the Millennium Ecosystem Assessment Program of UNEP, there are 15 terrestrial ecosystems, with Riparian biomes being one of them. Riparian ecosystems across the world have been reported to undergo vast degradation in terms of their stream corridors, resulting in depleted flora, fish and other fauna. Riparian systems often enjoy varied interfaces along the river course in terms of micro-ecological composition and hence varied flora, fauna and their varied behavioral responses ensue (www.nap.edu). Riparian forests persist in arid regions where there is insufficient precipitation to support upland forests, thus creating a distinct boundary.

Both riparian and semi-arid region characteristics are found in Agra, making it a unique habitat for the Pavonine species *Pavocristatus*. A cursory survey will reveal that *Pavocristatus* inhabits different types of riparian interfaces along the course of the river Yamuna in Agra *viz*- riparian interface with agricultural land, riparian interface with urban settlement and riparian interface with gardens.Thus these areas are an important habitat for this protected species.

2. Review of Literature

2.1 International status

Rands*et al*., (1984) studied the social organization of feral peafowl. de Silva *et al*., (1996) revealed some aspects of the population ecology of the Blue Peafowl. Petrie *et al*., (1999) reported the peacock lek with relatives even in the absence of social and environmental cues.Brickle (2002) suggested the habitat use, predicted distribution and conservation of Green Peafowl. Loyau*et al*., (2005) elucidated that multiple sexual advertisements reflect health status in *Pavocristatus.* Jun and Lan (1996) observed the time budgets of captive Green Peafowl. Fowler

(2011) reported general information about *Pavocristatus*in Animal Diversity Web (http://animaldiversity.org/accountsPavo_cristatus). Hernowo*et al*.,(2011) elucidated that the behavior of the Javan Green Peafowl. Yorzinski and Anoop (2013) observed the peacock copulation calls attract distant females and Beauchamp*et al*.,(2013) recorded the breeding and behavior of peafowl.Beauchamp (2014) analyzed calling and display by peacocks and Yorzinski and Platt (2014) reported the selective attention in peacocks during predator detection. Dakin and Montgomerie (2014) observed the deceptive copulation calls attract female visitors to peacock lek.Freeman and Hare (2015) recorded male-specific responses like vocalizations to infrasonic signals. Nichols and Yorzinski (2016) reported the peahens are able to differentiate between individuals based on the acoustic properties of anti-predator calls.Yorzinski*et al*., (2017) observed selective attention in peacocks during assessment of rival males.

2.2 National status

Hillgarth (1984) reported about social organization of the wild peafowl in India. Subramanian and John (2001) studied roosting and nesting habits of free ranging Indian Peafowl. Takahashi and Hasegawa (2008) analyzed seasonal and diurnal changes in calling activity of peafowl. Ramesh and McGowan (2009) revealed the current status of *P. cristatus*and Dasand Sivakumar (2009) studied population status and distribution pattern of Indian Peafowl. The behavior of *Pavocristatus*during the mating period in a natural population was analyzed by Harikrishnan*et al*., (2010).Girish and Tarsem (2011) studied seasonal variations in the population structure and population density of peafowl.Rajeshkumar and Balasubramanian (2011) revealed the habitat use and food habits of Indian Peafowl. Population indices and habitat association of Indian Peafowl were studied by Jain and Rana (2013).Deepa*et al*., (2013) studied the survival strategy, population and habitat utilization (domesticated and captive) of Indian Peafowl.The Hans India (2014) reported the population of peacocks on decline. Gokula and Muthukrishnan(2015) observed display behavior of Indian Peafowl during the mating season. Mittal and Chaturvedi (2016) studied breeding behavior of Indian Peafowl in Keoladeo National Park.

2.3Need of the study

Review of literature reveals that there is no holistic and comprehensive study on the activity patterns, all behaviors and interspecific interactions through all seasons for *P. cristatus*. In India as well as abroad, sporadic studies on singular aspects have been done, particularly on mating behavior. The other aspects comprising of at least 12 more behaviors has been largely ignored and not documented in a systematic manner, although ethology of any free ranging protected species holds vital and crucial information needed for any welfare and conservation efforts.

Therefore the present study has been designed to observe, quantify and analyze all behaviors across all seasons in *Pavocristatus* inhabiting the unique ecological region of Agra.

3.Objectives

1. To compare and analyze activity patterns and behavior of *Pavocristatus*atselected ripariansitesin Agra.
2. To compare and analyze seasonal variations in behavior of *Pavocristatus*.
3. To compare and analyzesite-specific social cognition in *Pavocristatus*.
4. To compare and analyze interspecific interactions of *Pavocristatus* with humans and non-human species.

4. Hypothesis

Following hypotheses have been formulated for the present study:

Null Hypothesis (H_0):- There is no significant difference in the behavior, social cognition, interspecific interactions and seasonal variationsin behavior of *Pavocristatus* at selected riparian sites.

Alternate Hypothesis (H_A):-There is significant difference in the behavior, social cognition,interspecific interactions and seasonal variations in behaviorof *Pavocristatus* at selected riparian sites.

5. Methodology

It is non-invasive study so does not require any ethical approval.

- Blind study will be conducted when feasible and appropriate (according to Traniello and Bukker 2015).

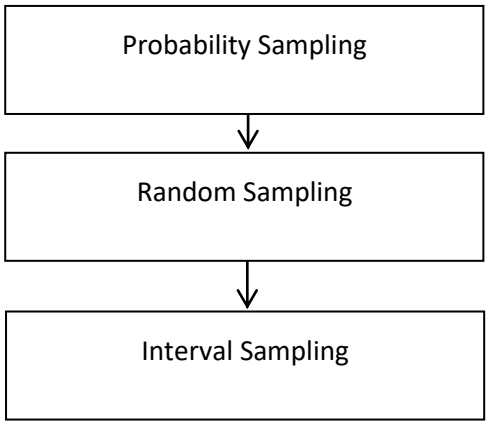
5.1Sampling sites

Three types of riparian interface sites have been identified:

1. **Dayalbagh**– Riparian interface with agricultural land
2. **Sikandra-** Riparian interface with urban settlement
3. **Shahjahan Gardens-**Riparian interface with gardens

5.2 Sampling methods

Random sampling because it is a free ranging bird and presence of any individual at a given place and time cannot be predicted.



5.3 Behavioral sampling techniques

The following sampling techniques will be employed-

1. Focal sampling technique (Martin and Bateson, 1993)
2. Scan sampling technique (Altman, 1973)
3. *Ad-libitum* sampling (Altman, 1973)

Activities of each subject will be observed and recorded on the respective data sheets. Each activity will be assigned a particular code to make the recording of data convenient.

Each field observation of an hour will be divided into four sampling periods of 15 min. each (observation period of 10 min. with 5 min. interval to prepare for next observation period).

5.4 Sample size

There is no information on the population trends of *Pavocristatus* at selected riparian sites,therefore the sample size cannot be predetermined. However, attempts will be made to discriminate between individuals on the basis of individual specific morphological ID marks/subtle details of body size, location, territory, partner, covert size, head and eye area and stance.

5.5 Observation schedule

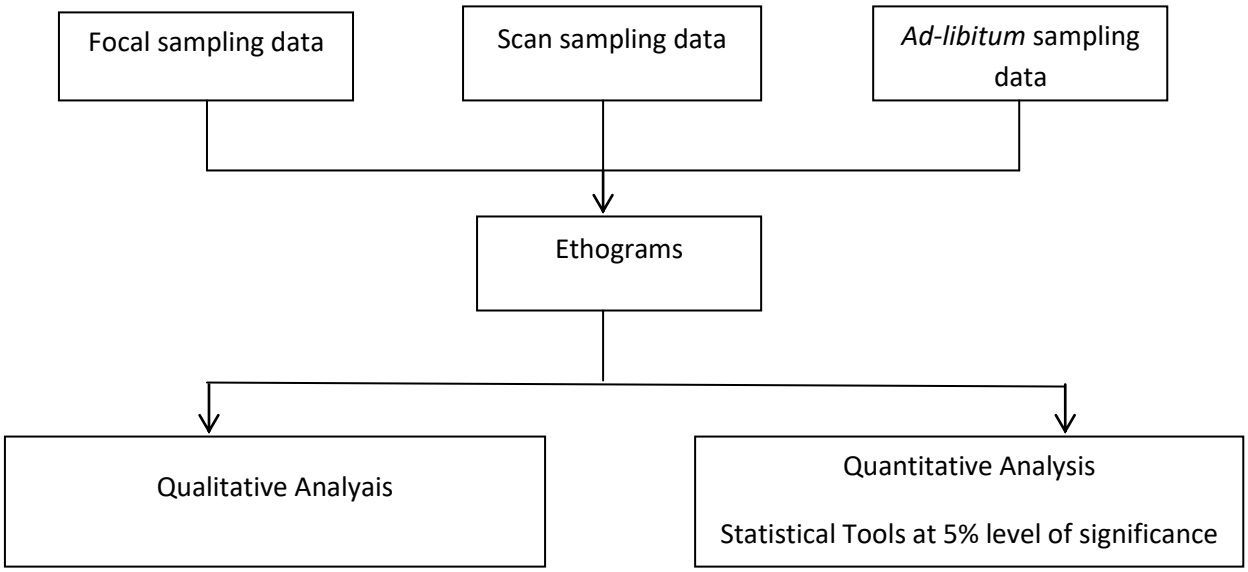
- The observation schedule of the study will be 6 AM to Noon and 5 PM to 7 PM
- Observations will be taken throughout the year across 5 different seasons (Spring, summer, monsoon, autumn and winter).

5.6 Tools and equipment

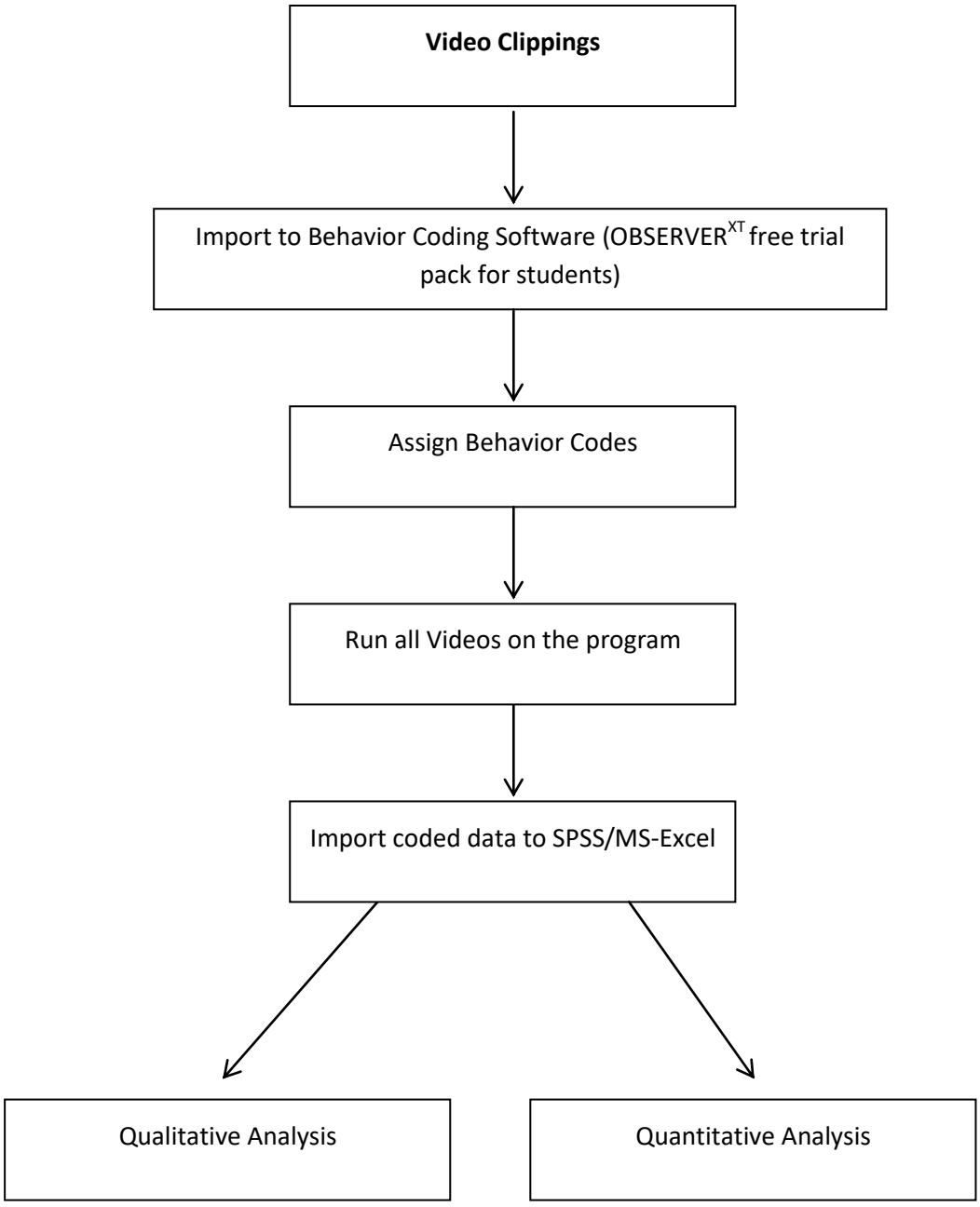
1. 24X optical zoom camera for still photography and videography.
2. Notepad
3. Stopwatch
4. Field audio recording device
5. Bio-acoustic analysis software (MATLAB)
6. Behavior coding software (Observer ^{XT} student trial pack)
7. Binoculars 8-16X 40 zoom DPS I field 5.0-3.4° with UV protection

6. Data Interpretation

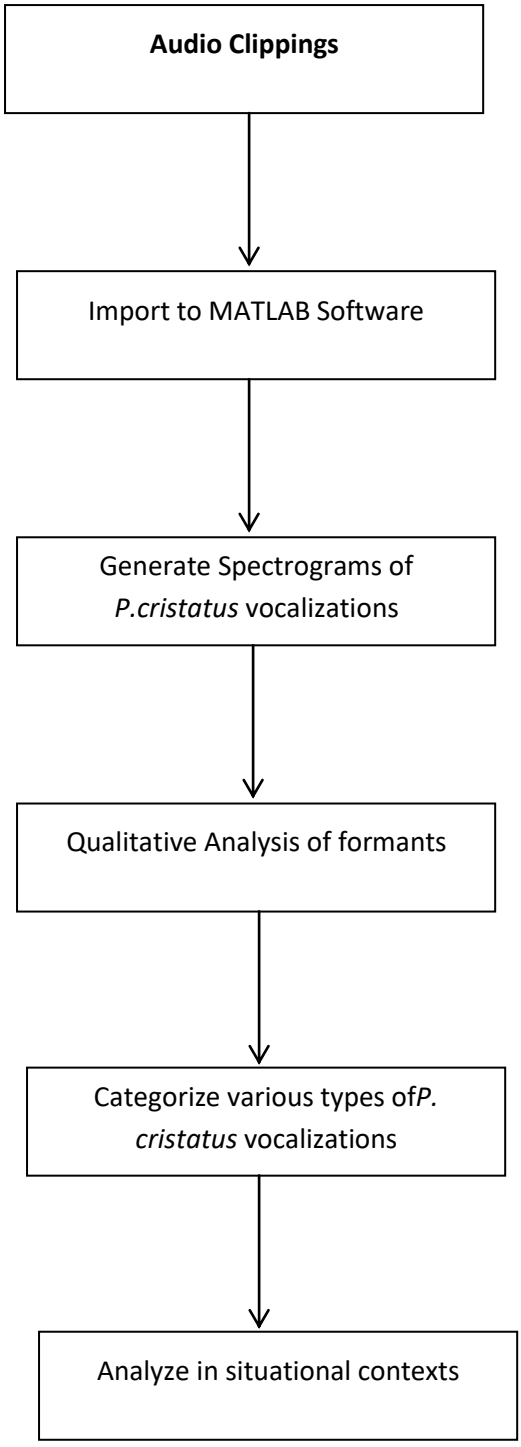
6.1 Manual Observations across 5 seasons – spring, summer, monsoon, autumn, winter



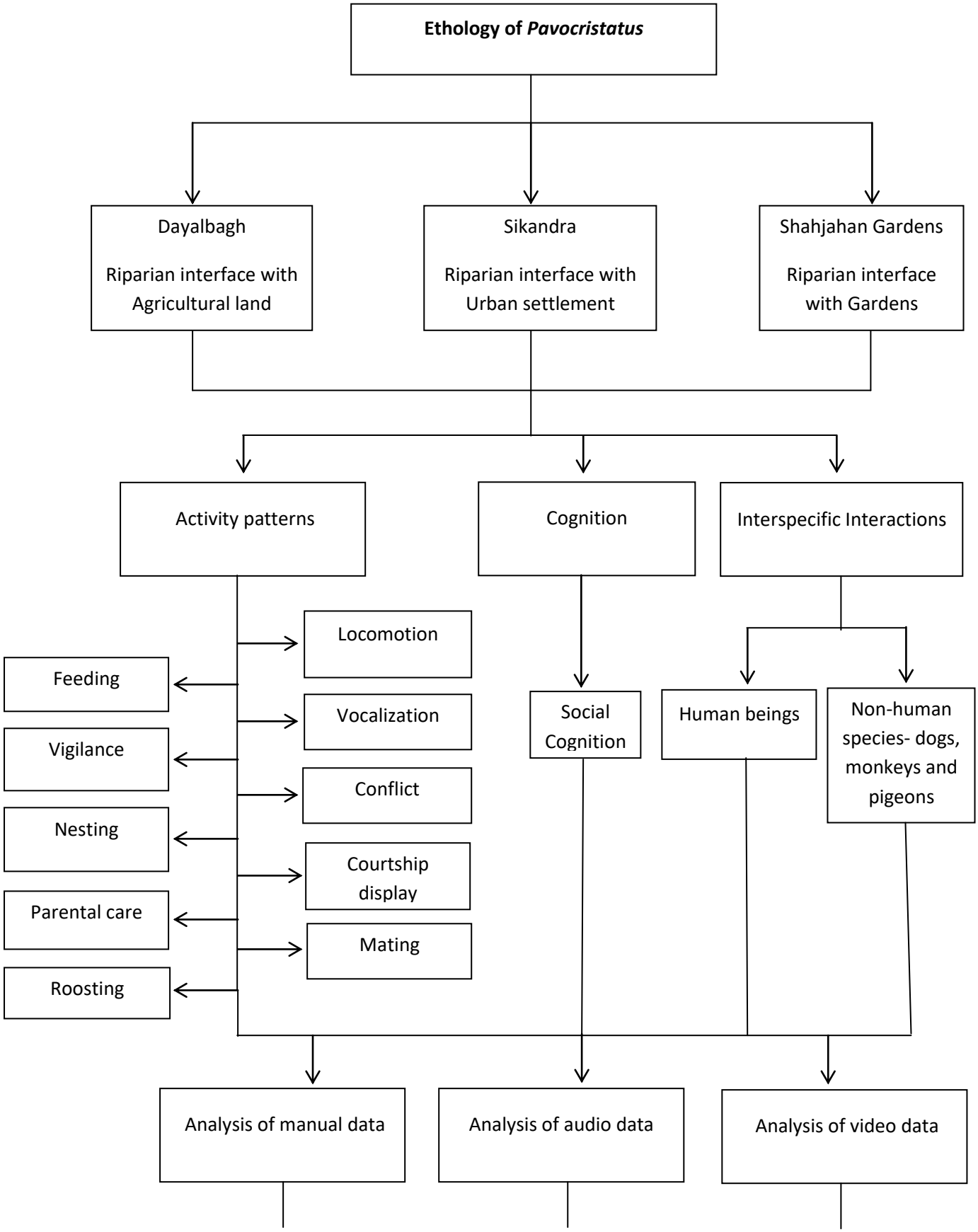
6.2 Video clippings


Video Clippings
Import to Behavior Coding Software (OBSERVER XT free trial pack for students)
Assign Behavior Codes
Run all Videos on the program
Import coded data to SPSS/MS-Excel
Qualitative Analysis
Quantitative Analysis

6.3 Audio clippings


Audio Clippings
Import to MATLAB Software
Generate Spectrograms of P.cristatus vocalizations
Qualitative Analysis of formants
Categorize various types of P. cristatus vocalizations
Analyze in situational contexts

7. Plan of Work



Data processing → Results → Hypotheses testing

Fig-1

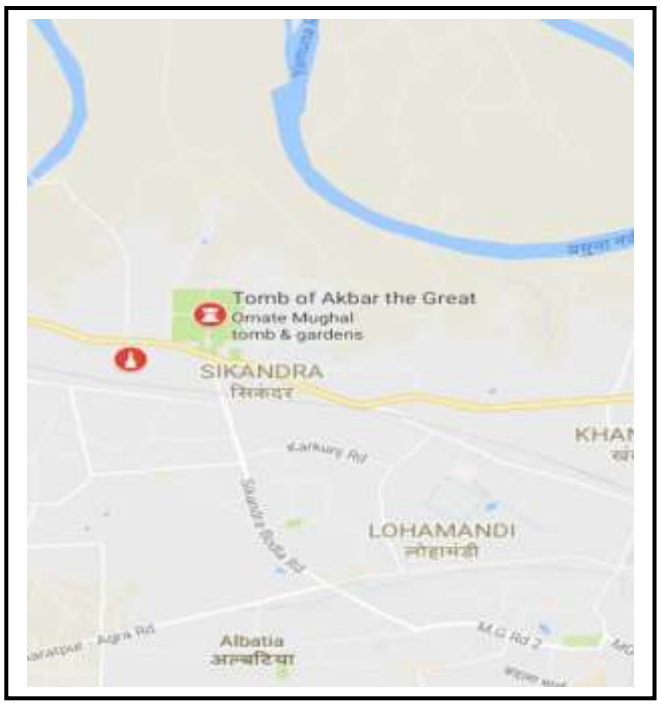


Fig-2

Fig-3

Fig. 1, 2 and 3:Google maps showing three selected Riparian sites in Agra

8. References

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